

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5**

**Date:** October 15, 1998

**Subject:** Information for Removal Action Memorandum for Sauget Area 2, Site Q,  
Sauget, St. Clair County, Illinois

**From:** Brenda Jones, Ecologist *[Signature]*

**To:** Michael McAteer, RPM

Presented below are my thoughts on the ecological risk assessment for the site listed above. Per our discussion, you can use any or all of the information below in the action memorandum for the removal action for the site.

Concentrations of metals and PCBs exceed toxicological benchmarks in both soils and sediments in the southern pond area, as indicated by the calculated hazard quotients (HQ). Hazard quotients are the ratio of toxicant concentration to toxicity thresholds. HQs that exceed 1.0 indicate risk, or potential for risk to ecological receptors (plants and animals).

The soil and sediment toxicant concentrations in the southern pond area exceed benchmarks by as much as 1 - 2 orders of magnitude for some contaminants. The specific metals of concern in soils are arsenic (HQ = 1.1), barium (HQ = 2.4), cadmium (HQ = 28), chromium (HQ = 16), lead (HQ = 16), mercury (HQ = 6), selenium (HQ = 3) and silver (HQ = 2), while the specific metals in sediments are cadmium (HQ = 5), lead (HQ = 5) and mercury (HQ = 1). PCB HQs range from 70 to 380 in sediments.

It should be emphasized that soil and sediment samples evaluated in the ecological risk assessment were not taken from areas known to have the highest concentrations since these areas were flooded at the time of sampling. Had these areas been sampled, the HQs would have been even higher.

The soil toxicity benchmarks are concentrations that can have adverse impacts on biota that either dwell in or come in contact with the soils. The sediment toxicity benchmarks are the lowest effect level sediment concentrations that can adversely impact some or all benthic invertebrates (i.e. sediment dwelling organisms). These benchmarks (both soil and sediment) are derived from laboratory and/or field toxicity tests.

Most of the metals detected (i.e. arsenic, barium, cadmium, chromium, lead, selenium and silver) are directly toxic to exposed organisms. Toxic responses can include the following:

- Arsenic: mortality, impaired reproduction, reduced growth;
- Barium: reduced growth rates, cardiovascular hypertension;

- Chromium: mortality;
- Cadmium: mortality, decreased growth rates, decreased reproduction, population alterations, anemia, kidney and liver damage; and
- Lead: mortality, impaired reproduction, reduced growth, impaired development and impaired metabolism;

Mercury and PCBs both bioaccumulate through the food chain and have adverse impacts on mammalian and avian upper trophic level receptors (predators). Mercury in high levels can cause appetite loss resulting in emaciation, brain lesions, diminished motor responses and in high enough levels, mortality. At low concentrations, mercury adversely affects reproduction, growth, behavior, metabolism, and oxygen exchange in aquatic organisms. In birds and mammals (exposed via food chain bioaccumulation) sublethal effects include adverse impacts on: growth, development, reproduction, blood and tissue chemistry, metabolism, and behavior.

The effects of PCBs on upper trophic level organisms is well documented. Ecological receptors (birds, mammals, fish) exposed to PCBs have reduced growth rates and survival, behavioral changes, developmental effects, impaired immune function and impaired reproductive rates. Recent studies found that short-term parental exposure of mink to PCBs had detrimental effects on survival and reproduction of subsequent generations conceived months after the parents were placed on clean feed (Restum et al. 1998; Shipp et al 1998).

#### Recommendations:

Based on the information presented above, there should be a removal of metals and PCBs in the southern pond area. Hazard quotients exceed 1.0, in some cases by 1 - 2 orders of magnitude. This indicates either high risks to ecological receptors are occurring or have the potential to occur due to exposure to soils and sediments in this area. Had sampling occurred in areas known to have higher contaminant concentrations, these HQs would have been much higher.

#### References:

- Restum, J.C., S. J. Bursian, J.P. Geisy, J. A. Render, W. G. Helferich, E. B. Shipp and D.A. Verbrugge. 1998. *Multigenerational Study of the Effects of Consumption of PCB-Contaminated Carp From Saginaw Bay, Lake Huron, on Mink. 1. Effects on Mink Reproduction, Kit Growth and Survival, and Selected Biological Parameters.* Journal of Environmental Health, Part A, 54:343-375.
- Shipp, E.B., J.C. Restum, J.P. Giesy, S.J. Bursian, R. J. Aulerich, W.G. Helferich.. 1998. *Multigenerational Study of the Effects of Consumption of PCB-Contaminated Carp From Saginaw Bay, Lake Huron, on Mink. 2. Liver PCB Concentration and Induction of Hepatic Cytochrome P-450 Activity as a Potential Biomarker for PCB Exposure.* Journal of Environmental Health, Part A, 54:377-407.